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The WDS Wireless Data System™ Operator's Manual

Rev 1.9.1

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WARNING: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation.

Agency Identification Numbers

Part Number	US/FCC	CAN/IC	EUR/EN
AC5124C-10	KQL-PKLR2400	CAN2268391158A	X
AC5124C-200	KQL-PKLR2400-200	CAN2268391180A	

Agency Approval Overview

Part Number	US/FCC	CAN/IC	EUR/EN**	Portable	Mobile	Fixed
AC5124C-10	X	X	X	X	X	X
AC5124C-200	X	X			X-32cm*	X-32cm*

** Does not Include France or Spain

Other Countries:

Some countries not listed accept emissions / broadcast radio compliance certifications from the countries listed above. Other national compliance certification applications are pending and may be secured in the future. For current information about a country not listed above, please contact City Theatrical.

Welcome to the WDS Wireless Data System

Thank you for choosing the WDS Wireless Data System™. The WDS System has been engineered to be reliable, roadworthy, easy to use, and compatible with other standard 2.4GHz wireless data and communications systems. Every effort has been made to anticipate your questions in this manual, but if you have any questions that are not answered here, or you want to discuss a special application, please feel free to contact us directly at City Theatrical. The WDS System includes a wide range of products which you may review at our website (www.citytheatrical.com) or in our catalog. For basic operation, a minimum of one WDS Transmitter and one WDS Receiver is required.

Getting Started with the WDS Wireless Data System

Setting up a WDS system is quite similar to setting up any DMX512 based system. The principle thing to remember is that the WDS Transmitter and Receiver(s) *replace* DMX cable.

System Flow: DMX 512 control data from any standard DMX 512 console is output to the WDS Transmitter, which converts that DMX data to a radio signal and broadcasts it to the WDS Receiver (or Receivers). The WDS Receiver takes the radio broadcast and converts it back into standard DMX 512 data, which can than be connected via standard cables to WDS 15A Dimmers or *any other* DMX devices such as moving lights, effects, etc.

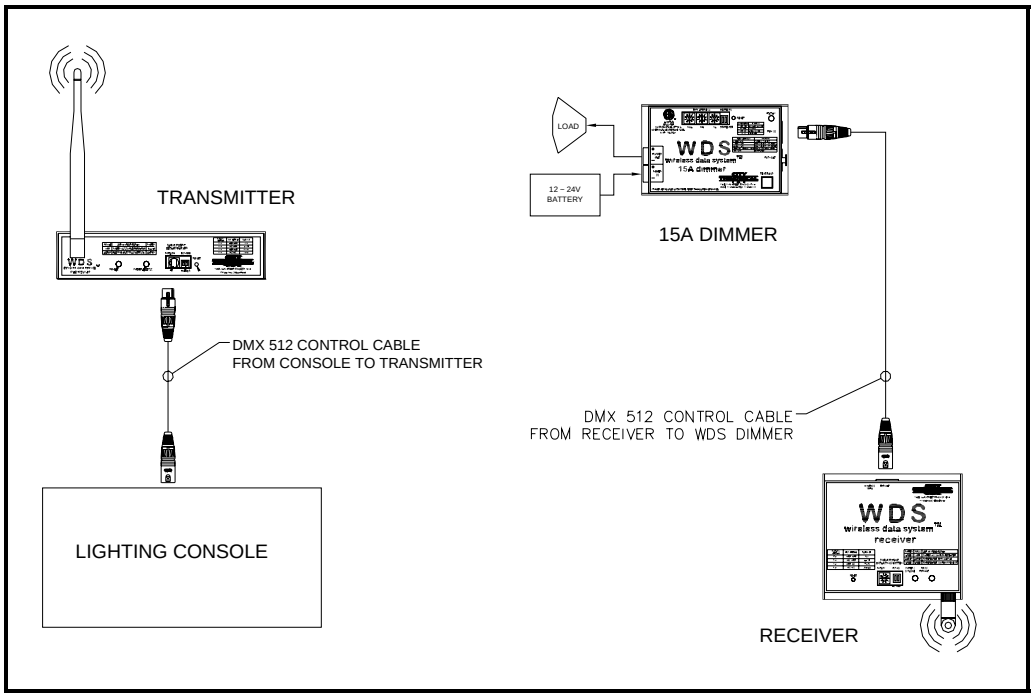

Figure 1, Typical WDS System Riser

Connection and configuration of a typical WDS System:

1. Install the WDS Transmitter in a convenient location within range[1] of the desired Receiver location(s). Transmitters should be elevated above the audience (or other barriers) whenever possible; height is good!
2. Set the WDS Transmitter's radio channel via the Radio Channel rotary switch (1 through 8) and System ID 2 position DIP switch (see Figure 2 for details.) **The Transmitter and Receiver radio channel and system ID settings must match for them to communicate.**
3. Connect the DMX 512 Console's DMX output to the WDS Transmitter via a standard DMX 512 cable and then connect the transmitter power supply. After the unit is powered up and initializes itself, the status LEDs will read:
    a. POWER/DMX IN: Amber
    b. RF OUT: Amber
4. Set the WDS Receiver's radio channel to match the Transmitter via its channel rotary switch and system ID two position DIP switch.
5. Connect Receiver power using either a WDS DC power adapter (#5525 or #5527) or a WDS Battery Cable (#5550, #5552, #5554, or #5556). After power up and initialization, the Receiver status LEDs will read:
    a. POWER/IN RANGE: Amber
    b. RF IN/DMX OUT: Amber
6. Set the Dimmer's DMX address to any desired value between 1 and 512 using the DMX address switches.
7. Connect the Dimmer to (battery) power via the POWER IN connectors, and connect the load via the DIMMER OUT connectors. After power up and initialization, the Dimmer POWER/STATUS LED should be blinking green.
8. Connect the Receiver's DMX output to the DMX input of the WDS Dimmer. The Dimmer POWER/STATUS LED should now be solid green.
9. Test the load connection using the TEST/bump button.
10. When the Dimmer is brought up to a level, the POWER/STATUS LED will track the level dimming between Green at OFF and Amber at FULL.

About the LEDs: All of the WDS Status LEDs are bi-color, meaning they each contain a red and a green LED element. When both elements are fired, the LED will appear amber.

[1] (see *Working in the Wireless World*, page 33)

The WDS Transmitter # 5500 (200MW) or #5501 (10MW)

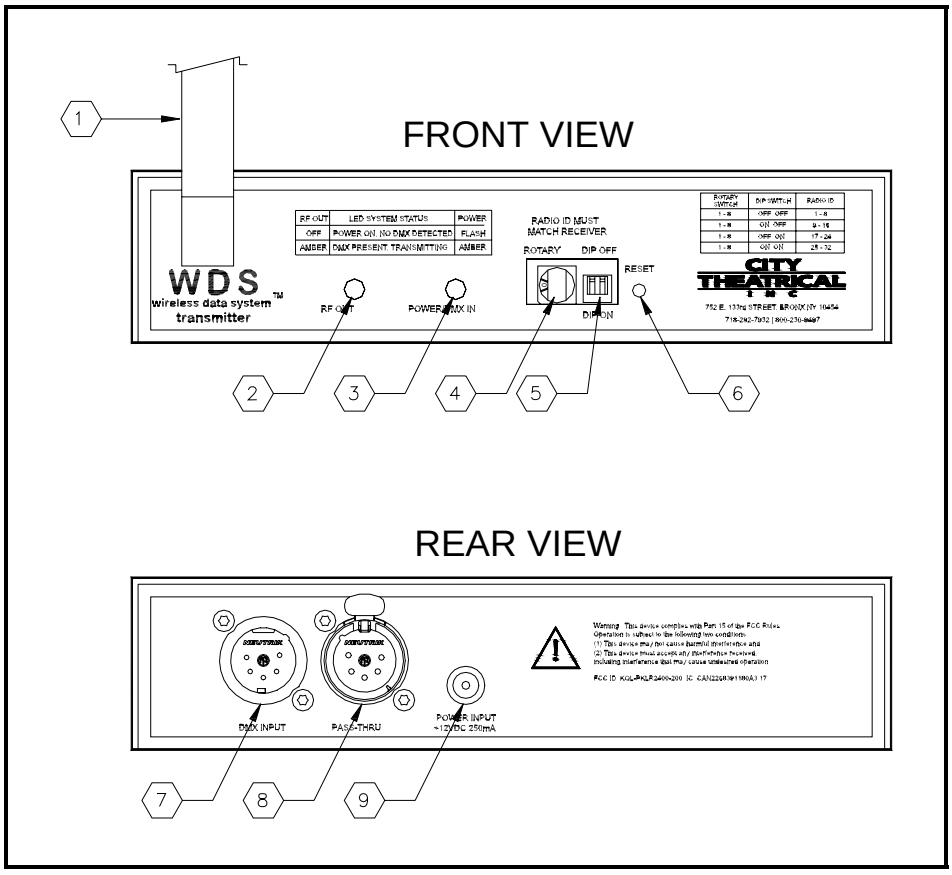

Figure 2, WDS Transmitter Front and Back Panels

The WDS Transmitter receives standard DMX 512 via its DMX INPUT, and broadcasts that DMX data as a radio signal. The Transmitter is equipped with the following features (see Figure 2):

Front Panel:

1. Antenna: The antenna is multi-positional and may easily be removed for shipping or storage; unscrew to remove. Be sure not to over-tighten when attaching the antenna as the internal cabling may break.

2. RF OUT LED (item 2): This LED indicates inter-processor communication and RF broadcast. During normal operation, the LED will flash green briefly to indicate the internal processors are communicating. Once valid DMX is established, this LED will go to steady amber to indicate that the Transmitter is broadcasting.

3. Power/DMX IN LED (item 3): This LED will light green to indicate power is connected, and change to red/amber when ever DMX input is detected. It flashes between green and amber if DMX is lost after being detected.

LED Indicator	Color/Status	Indication
RF OUT LED (item 2)	Momentary Flash Green/Red	CPUs Communicating, System Ready
	Steady Amber	Transmitting
Power/DMX IN LED (item 3)	Steady Amber	DMX Data Present
	Flashing between Green and Amber	Power ON, No DMX

Figure 3, Transmitter LED Key

4. RADIO ID CHANNEL select switch: Switch positions 1-8 select (settings 9 & 0 are reserved for diagnostics and special functions.)

5. ID DIP switch: This 2 position DIP switch works with the Radio Channel select switch to permit selection of any of the 32 available radio channels, as per the chart below. **Note: On the Transmitter, these switches are OFF when they are UP.**

Radio Channel Select Switch	ID DIP Switch	Radio Channels
1 - 8	OFF OFF	1 – 8
1 - 8	ON OFF	9 – 16
1 - 8	OFF ON	17 – 24
1 - 8	ON ON	25 – 32

6. RESET switch: This switch is recessed to prevent unintentional operation. Press with a pen or other similar device to reset the Transmitter's internal processors.

Back Panel:

7. DMX INPUT, 5P XLR Male: This is a standard DMX 512 input. Connect to the desired output port of your console to broadcast that port's DMX 512 data.

8. DMX PASS-THRU, 5P XLR Female: This Pass-Thru is provided to allow connection of down-stream DMX devices. The WDS Transmitter DMX output is optically isolated from the input, CPU set, and other Transmitter circuitry.

   DMX INPUT/PASS-THRU special features:
   - The DMX INPUT is provided with auto-termination, so no other end-of-line termination setting is required.
   - During normal operation, the WDS Transmitter regenerates the DMX 512 DATA presented at the Pass-Thru output, so the output may supply a full compliment of DMX load.
   - If the power supply is removed or other system failure occurs, the DMX input will automatically be switched over to a hardwired connection to the pass-thru, assuring continued delivery of the DMX data to down stream devices.

9. +12V power supply connection: Connect the Mains Power/+12V adapter here to power the unit.

CE Compliance:
The #5501 (10MW) Transmitter is available in a CE compliant version.

The WDS Receiver #5510

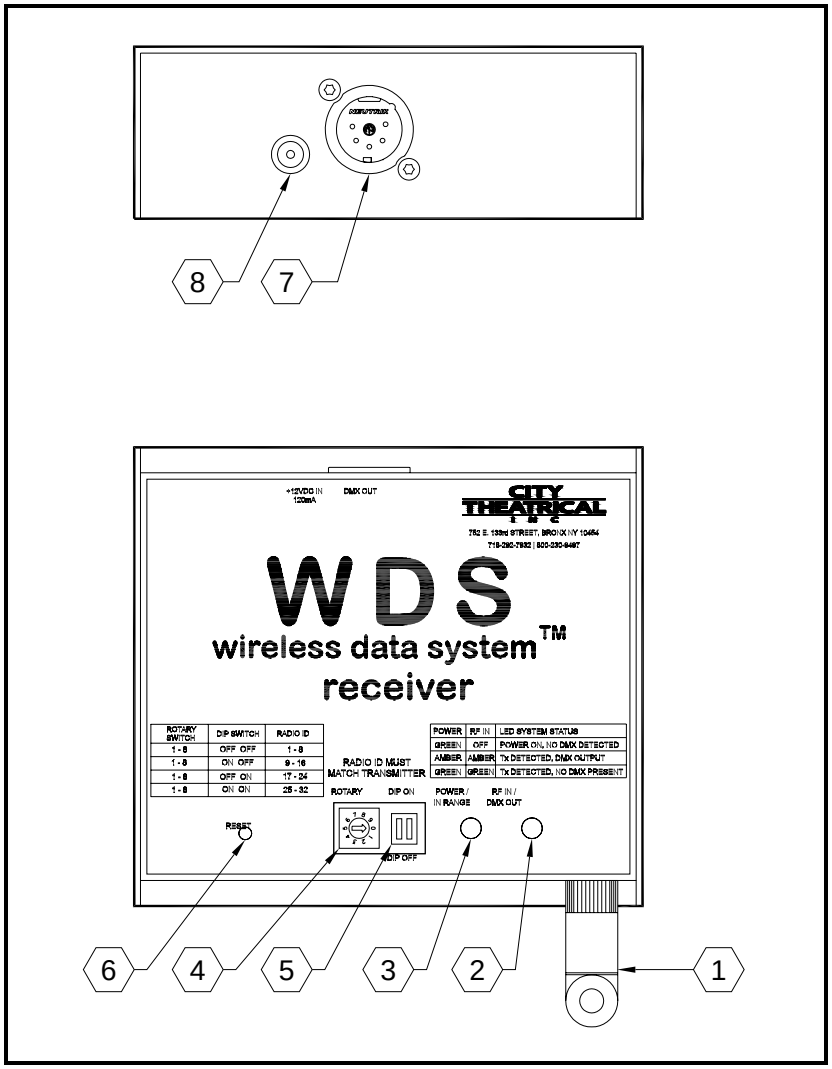

Figure 4, WDS Receiver Top and Back Panels

The WDS Receiver receives DMX data as a radio signal, and outputs that data as standard DMX 512 via its DMX OUTPUT connector. The Receiver is equipped with the following features (see Figure 2):

1. Antenna: The antenna is multi-positional and may easily be removed for shipping or storage; unscrew to remove. Be sure not to over-tighten when attaching the antenna as the internal cabling may break

2. POWER/IN RANGE LED (D4): This LED indicates the unit has Power and is in range of a Transmitter. This LED will light Green to indicate power is connected, and change to Amber whenever a correctly configured Transmitter is detected.

3. RF IN/DMX OUT LED (D3): This LED lights Green when the unit is receiving RF DMX data and Red when outputting standard DMX. Since the unit begins outputting DMX as soon as it receives RF, this LED normally appears amber when receiving/outputting.

LED Indicator	Color/Status	Indication
POWER/IN RANGE (2)	Green	Power Connected
	Amber	Transmitter Detected
RF IN/DMX OUT (3)	Green	Receiving RF DMX
	Amber	Outputting DMX

Figure 5, Receiver LED Key

4. RADIO CHANNEL select switch: Switch positions 1-8 select (settings 9 & 0 are reserved for diagnostics and special functions).

5. ID DIP switch: This 2 position DIP switch works with the Radio Channel select switch to permit selection of any of the 32 available radio channels, as per the following chart:

Radio Channel Select Switch	ID DIP Switch	Radio Channels
1 - 8	OFF OFF	1 - 8
1 - 8	ON OFF	9 - 16
1 - 8	OFF ON	17 - 24
1 - 8	ON ON	25 - 32

Figure 6, Radio Selection Chart

6. RESET switch: This switch is recessed to prevent unintentional operation. Press with a pen or other similar device to reset the Receiver's internal processors.

7. DMX OUTPUT, 5P XLR Female: This is a standard DMX 512 output. Connect to WDS Dimmers or other DMX devices.

8. +12V power supply connection. Connect the Mains Power/+12V adapter *or* +12V battery here to power the unit.

CE Compliance

The #5510 Receiver is available in a CE compliant version.

The WDS Rx2 Receiver #5512

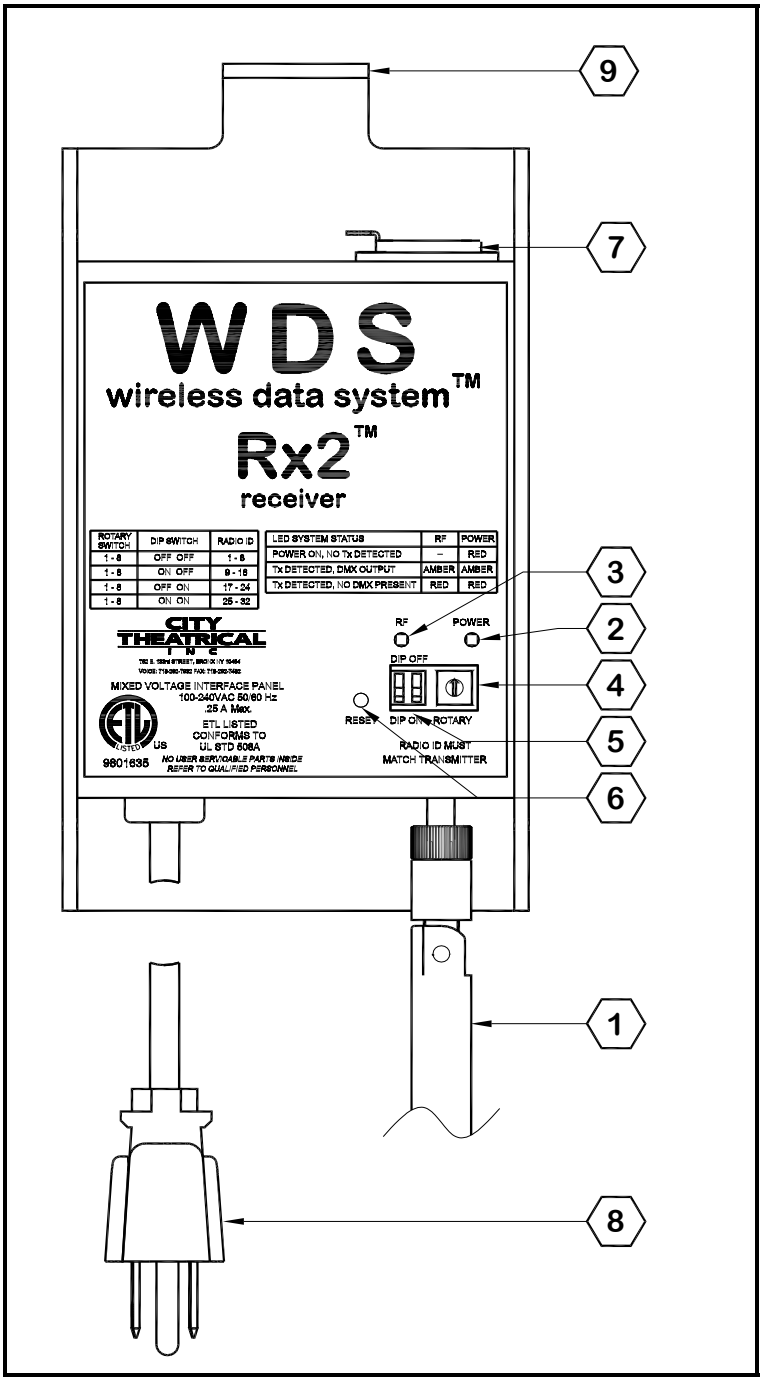

Figure 7, Rx2 Receiver

The WDS Rx2 Receiver is a full-featured WDS Wireless DMX Receiver for use wherever a mains powered wireless DMX Receiver is needed. The WDS Rx2 receives DMX data as a radio signal, and outputs that data as standard DMX 512 via its DMX OUTPUT

connector. The Rx2 is ETL Listed to UL 508A and is available in a CE compliant version. The socket-outlet shall be installed near the equipment and shall be easily accessible, i.e., do not run excessively long extensions cords of insufficient gauge to power the unit.

The Rx2 is equipped with the following features:

1. Antenna: The antenna is multi-positional and may easily be removed for shipping or storage; unscrew to remove. Be sure not to over-tighten when attaching the antenna as the internal cabling may break.

2. POWER LED (L1): This LED indicates the unit has power and is in range of a Transmitter. This LED will light red to indicate power is connected, and change to amber whenever a correctly configured Transmitter is detected.

3. RF LED (L2): This LED lights Red when the unit is receiving RF DMX data and green when outputting standard DMX. Since the unit begins outputting DMX as soon as it receives RF, this LED normally appears amber when receiving/outputting.

L1	L2	Status
Red	-	Power ON, No Tx Detected
Amber	Amber	Tx Detected, DMX Transmitting
Red	Red	Tx Detected, DMX Lost

Figure 8, Rx2 LED Key

4. RADIO CHANNEL select switch: Switch positions 1-8 select (settings 9 & 0 are reserved for diagnostics and special functions).

5. ID DIP switch: This 2 position DIP switch works with the Radio Channel select switch to permit selection of any of the 32 available radio channels, as per the chart below. Note ON/OFF markings on the DIP switches.

Radio Channel Select Switch	ID DIP Switch	Radio Channels
1 - 8	OFF OFF	1 - 8
1 - 8	ON OFF	9 - 16
1 - 8	OFF ON	17 - 24
1 - 8	ON ON	25 - 32

Figure 9, Radio Selection Chart

6. RESET switch: This switch is recessed to prevent unintentional operation. Press with a pen or other similar device to reset the Rx2's internal processors.

7. DMX OUTPUT, 5P XLR Female: This is a standard DMX 512 output. Connect to WDS Dimmers or other DMX devices

8. Auto-ranging Mains Power Connection: Connect to 100~240 VAC 50/60 Hz. Although provided with a standard North American NEMA 5-15P ("Edison") power plug, the Rx2 will work with any mains power voltage within the 100~240 VAC 50/60 Hz range.

9. C-Clamp Attachment: The Rx2 can be fitted with a standard theatrical C-Clamp for pipe and truss mounting.

Fuse Replacement

In the event that your Rx2's fuse has blown, it can be replaced by a qualified individual. Remove the (4) flat head Philips screws securing the cover, locate the fuse on the power supply circuit board and carefully remove. Replace with a .25A 250V 2AG/5mm fuse, carefully snapping it into place. Replace the cover and screws, and test the unit to make sure it is working properly.

The 15A Dimmer #5520

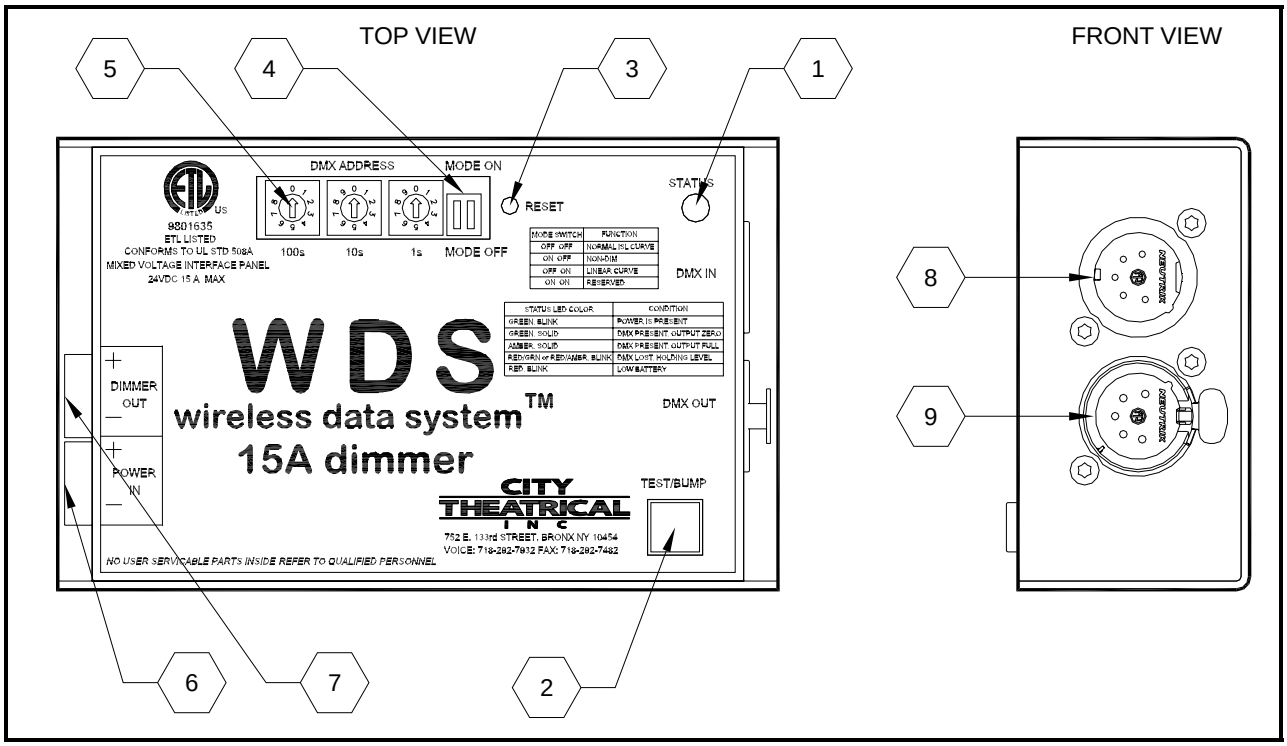

Figure 10, 15A Dimmer Top and Front Panel

1. STATUS/POWER LED: This single Bi-Color LED indicates the status of a number of things including power, DMX, and output.

   The LED conditions are as follows:

LED State/Color	**Condition**
Regular blinking Green	Dimmer has power, CPU is running
Solid Green	DMX Present, Output OFF
Solid Amber	DMX Present, Output FULL
Flashing between Red and Green/Amber	DMX Lost, Dimmer holding Last Level
Flashing Red	Low Battery

Figure 11, 15A Dimmer LED Key

2. TEST/BUMP Button: Press to test fire load (the LED will turn amber when the button is pressed.)

3. RESET switch: This switch is recessed to prevent unintentional operation. Press with a pen or other similar device to reset the Dimmer's internal processors.

4. MODE DIP switch: This 2 position DIP switch selects the operation mode as follows

Switch Setting	Function
OFF OFF	Normal Dimming, ISL Curve
ON OFF	NON - DIM
OFF ON	Linear Dimming Curve
ON ON	*Reserved*

Figure 12, Mode Switch Selection Chart

5. DMX ADDRESS BCD Rotary Switches: These BCD rotary switches are used to set the unit's specific DMX address to any value from 1 to 512.

6. POWER IN Anderson Power Pole Connector Set: Connect to Battery Power. Red = +12-24VDC, Black = DC Common.

7. DIMMER OUT Anderson Power Pole Connector Set: Connect to the load to be dimmed. Yellow = + VDC (0-Full), Blue = DC Common .

8. DMX INPUT, 5P XLR Male: This is a standard DMX 512 input. Connect to the DMX output port of the Receiver, or any standard DMX output device.

9. DMX PASS-THRU, 5P XLR Female: This pass-thru is provided to allow connection of downstream DMX devices.

   DMX INPUT/PASS-THRU special features:
   - The DMX INPUT is provided with auto-termination, so no other end-of-line termination setting is required.
   - During normal operation, the WDS 15 Amp Dimmer re-generates the DMX 512 data presented at the Pass-Thru output, so the output may supply a full compliment of DMX load.
   - If the power supply is removed or other system failure occurs, the DMX input will automatically be switched over to a hardwired connection to the pass-thru, assuring continued delivery of the DMX data to downstream devices.

Protective Features

- Low Battery Power: If the connected Battery drops below a preset voltage, the Dimmer will shut down, and will not restart until reset (the Low Battery indication will light). This feature protects rechargeable batteries from discharging to the point where they cannot be recharged with a standard charger. The standard factory set cut-off point is 7VDC. Other settings are available on a custom basis; please consult City Theatrical.

- Internal Watchdog for DMX processor and Dimmer Processor: If the DMX processor fails, the LED will flash at 1 sec interval (red or amber depending on DMX failure mode) and the load output will be turned off, protecting the battery and load. If the Dimmer processor fails, the load output will be turned off, protecting the battery and load.

- Internal reverse power polarity protection: The internal power supply circuitry is designed to protect the control electronics from damage if the battery leads are accidentally reversed or plugged into the DIMMER OUTPUT connection.

- Hold Last valid DMX Level: If DMX is lost, the WDS 15A Dimmer will hold the last valid level for about 5 minutes, and then fade to black.

Switch Diagnostics
Setting the BCDs to the settings shown below and resetting the unit will start the following diagnostic self tests:

BCD Settings	MODE DIP Settings	Function Tested	Indication
601		Ones (1s) BCD	LED Will flash = to the number the "1s" BCD is set to
602		Tens (10s) BCD	LED Will flash = to the number the "10s" BCD is set to
603		Hundreds (100s) BCD	LED Will flash = to the number the "100s" BCD is set to
604	0 0	DIP Switch	No LED Flashes
	0 1	DIP Switch	1 LED Flash
	1 0	DIP Switch	2 LED Flashes
	1 1	DIP Switch	Fast Red/Green/Amber Flashes
605		Manually Set Output Level	After reset move the tens and ones BCD switches to manually set the lamp to a % level

Figure 13, Switch Diagnostics

The BCD test setting must be set (as above) ether before power is applied or reset is pressed.

Fuse Replacement
The 15A Dimmer contains a replaceable ATO 15A Fuse. Refer to qualified service personnel if your unit needs a fuse replacement.

Wire Gauge
When installing this unit in a system, City Theatrical recommends 12 gauge wiring between all line and load devices to minimize voltage drop, otherwise significant damage could result to the equipment.

Operating Temperature
Maximum ambient operating temperature is 40°C.

CE Compliance
The #5520 15A Dimmer is available in a CE compliant version. Look for the CE marking to verify.

The WDS Personal Dimmer #5515

The WDS Personal Dimmer combines a WDS DC Dimmer with its own dedicated 2.4GHz Receiver to provide wireless dimming in a very small, lightweight and concealable package that can be worn with the provided belt clip, or hidden in a prop or set piece. The Personal Dimmer is internally fused at 5A.

Features:

- Integral 32 Channel 2.4GHz WDS Receiver
- Integral Class 2 power limited 5A Dimmer
- Operating power range +9~24 VDC
- Very small size
- Use with belt clip or mount flat in prop or set piece
- Works with Standard WDS Transmitter
- Can be used in any WDS system with all other WDS products

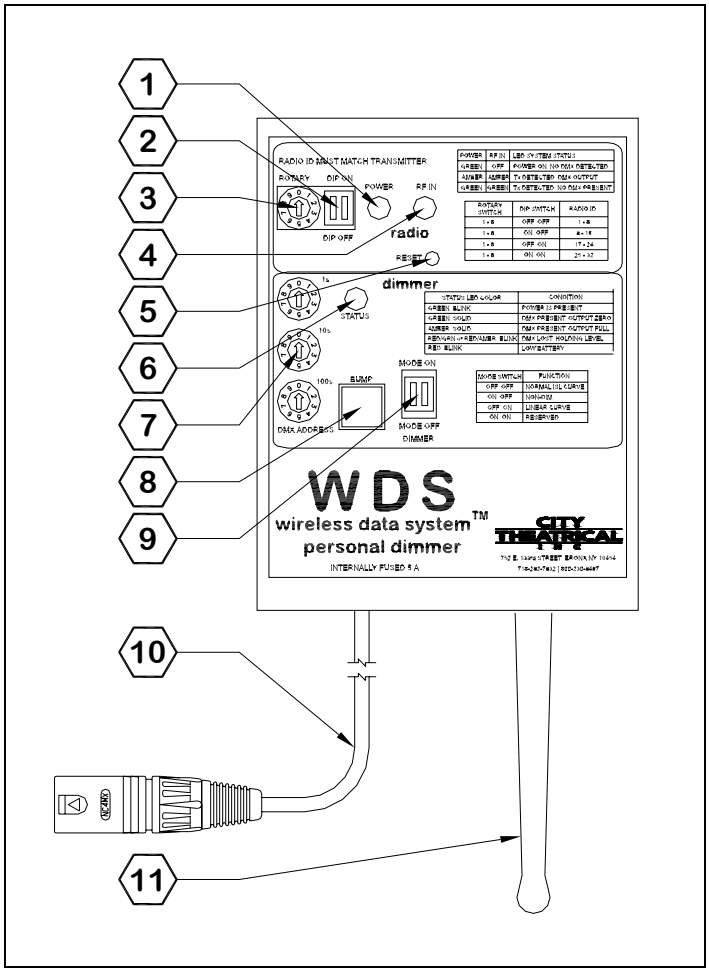

Figure 14, WDS Personal Dimmer

Personal Dimmer Radio Controls

1. POWER/IN RANGE LED (D4): This LED indicates the unit has power and is in range of a Transmitter. This LED will light green to indicate power is connected, and change to amber whenever a correctly configured Transmitter is detected.

2. ID DIP switch: This 2 position DIP switch works with the radio channel select switch to permit selection of any of the 32 available radio channels, as per the following chart:

Radio Channel Select Switch	ID DIP Switch	Radio Channels
1 - 8	OFF OFF	1 - 8
1 - 8	ON OFF	9 - 16
1 - 8	OFF ON	17 - 24
1 - 8	ON ON	25 - 32

Figure 15, Radio & Dip Switch Key

3. RADIO CHANNEL select switch: Switch positions 1-8 select (settings 9 & 0 are reserved for diagnostics and special functions).

4. RF IN/DMX OUT LED (D3): This LED lights green when the unit is receiving RF DMX data and red when outputting standard DMX. Since the unit begins outputting DMX as soon as it receives RF, this LED normally appears amber when receiving/outputting.

Radio LED Indicator	Color/Status	Indication
POWER/IN RANGE	Green	Power Connected
	Amber	Transmitter Detected
RF IN/DMX OUT	Green	Receiving RF DMX
	Amber	Outputting DMX

Figure 16, PD Radio LED Key

5. RESET switch: This switch will reset the entire Personal Dimmer unit (both Radio receiver and Dimmer). It is recessed to prevent unintentional operation. Press with a pen or other similar device to reset the Personal Dimmer's internal processors.

6. STATUS/POWER LED: This single Bi-Color LED indicates the status of a number of things including power, DMX, and output.

   The LED conditions are as follows:

Dimmer LED State/Color	Condition
Regular blinking Green	Dimmer has power, CPU is running
Solid Green	DMX Present, Output OFF
Solid Amber	DMX Present, Output FULL
Flashing between Red and Green/Amber	DMX Lost, Dimmer holding Last Level
Flashing Red	Low Battery

Figure 17, PD Dimmer LED Key

7. DMX ADDRESS BCD Rotary Switches: These BCD rotary switches are used to set the unit's specific DMX address to any value from 1 to 512.

8. TEST/BUMP Button: Press to test fire load (the LED will turn amber when the button is pressed).

9. MODE DIP switch: This 2 position DIP switch selects the operation mode as follows:

Switch Setting	Function
OFF OFF	Normal Dimming, ISL Curve
ON OFF	NON - DIM
OFF ON	Linear Dimming Curve
ON ON	*Reserved*

Figure 18, PD Mode Dip Switch Key

10. 4P XLR Tail for power input and load output connections:

Pin	Function
1	Input DC Common
2	Input 9~12 +VDC
3	Output DC Common
4	Output Dimmed +VDC

Figure 19, XLR Tail Pin Configuration

11. Flexible antenna

Personal Dimmer Operating and Protective Features

- Class 2 Power Limitation: Because the Personal Dimmer is intended for use in installations where actors, dancers and technicians may come into regular contact with the unit while it is operating, it is pre-configured as an NEC 725 Class 2 low power device with a 12V 5A / 60W maximum power limitation. If control is needed for higher voltage or higher wattage devices, the standard 15A Dimmer or 30A Custom Dimmer should be used.

- 9V Battery operation: The WDS Personal Dimmer will operate with small loads from a single 9V Battery. In a typical application, the Personal Dimmer with a .150A load will run for up to two hours on a single 9V Battery. Two or more batteries may be connected in parallel for extended operation or higher loads.

- Low Battery Power Sense: If the connected Battery drops below a preset voltage, the Dimmer will shut down, and will not restart until reset (the Low Battery indication will light). This feature protects rechargeable batteries from discharging to the point where they cannot be recharged with a standard charger. The standard factory set cut-off point for the Personal Dimmer is 5.5VDC. Other settings are available on a custom basis, please consult City Theatrical.

- Internal Watchdog for DMX processor and Dimmer Processor: If the DMX processor fails, the LED will flash at 1 sec interval (red or amber depending on DMX failure mode) and the load output will be turned off, protecting the battery and load. If the Dimmer processor fails, the load output will be turned off, protecting the battery and load.

- Internal reverse power polarity protection: The internal power supply circuitry is designed to protect the control electronics from damage if the battery leads are accidentally reversed or plugged into the DIMMER OUTPUT connection.

- Hold Last valid DMX Level: If DMX is lost, the WDS PD will hold the last valid level for about 5 minutes, and then fade to black.

Switch Diagnostics

Setting the BCDs to the settings shown below and resetting the unit will start the following diagnostic self tests:

BCD Settings	MODE DIP Settings	Function Tested	Indication
601		Ones (1s) BCD	LED Will flash = to the number the “1s” BCD is set to
602		Tens (10s) BCD	LED Will flash = to the number the “10s” BCD is set to
603		Hundreds (100s) BCD	LED Will flash = to the number the “100s” BCD is set to
604	0 0	DIP Switch	No LED Flashes
	0 1	DIP Switch	1 LED Flash
	1 0	DIP Switch	2 LED Flashes
	1 1	DIP Switch	Fast Red/Green/Amber Flashes
605		Manually Set Output Level	After reset move the tens and ones BCD switches to manually set the lamp to a % level

Figure 20, PD Switch Diagnostics

The BCD test setting must be set (as above) either before power is applied or reset is pressed.

The OEM Receiver #5505

The 5505 WDS OEM Wireless DMX 512 Receiver can be built into any DMX device, providing instant cable-free connectivity with the mission critical reliability of 2.4GHz Frequency Hopping Spread Spectrum (FHSS) technology. For installation instructions, please refer to "The WDS OEM™ Wireless DMX Receiver Installation and User's Guide."

The WDS OEM Wireless Receiver includes the following features:

- Works with standard WDS Transmitter
- Miniature size (1.95" x 2.65") PCBA
- Advanced surface mount technology
- 4 layer FR4 UL94-V0 PC Board
- Status LEDs for radio functions, power and DMX output
- DMX512 Output via 5 pin .100" Header
- Reception capability: 512 channels of DMX 512 data (1 full universe)
- 32 user selectable FHSS hopping patterns
- Typical effective range:
    - 400 ~ 600' indoors with standard antennas (line of sight)
    - 1000' ~ 1500' outdoors with standard antennas (line of sight)
    - 800 yards ~ several miles, with high power directional antennas, depending on transmitter power, antennas and broadcast environment
- Compliance:
    - CE Certified, RoHS Compliant
    - 10 mW Transceiver - US (FCC15.247), Canada (IC), Europe (EN, Does not include France or Spain)

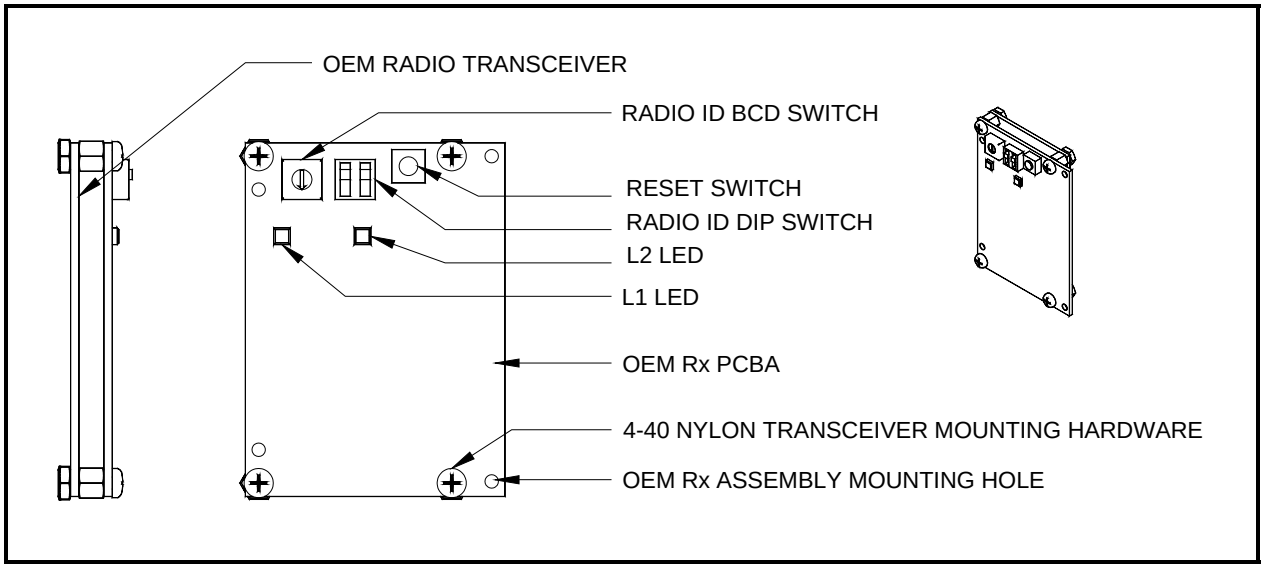

Figure 21, WDS OEM Receiver Card Layout

Operating the WDS OEM Receiver (Rx)

The WDS OEM Rx receives DMX data as a radio signal, and outputs that data as standard DMX 512 via its DMX OUTPUT connector, just like other WDS products. The only difference is the WDS OEM Rx can be installed in any number of devices not manufactured directly by City Theatrical.

The OEM Rx is equipped with the following features:

1. Antenna: The OEM Rx will work with a number of antennas. City Theatrical stocks a small flexible "Rubber Ducky" with integral cable and a (longer range) 7" adjustable/ removable unit that uses a separate cable. Kits will be equipped based on your specific application and order.

2. POWER LED (L1): This LED indicates the unit has power and is in range of a Transmitter. This LED will light red to indicate power is connected, and change to Amber whenever a correctly configured Transmitter is detected.

3. RF LED (L2): This LED lights red when the unit is receiving RF DMX data and green when outputting standard DMX. Since the unit begins outputting DMX as soon as it receives RF, this LED normally appears amber when receiving/outputting.

L1	L2	Status
Red	-	Power ON, No Tx Detected
Amber	Amber	Tx Detected, DMX Transmitting
Red	Red	Tx Detected, DMX Lost

Figure 22, Receiver LED Key

4. RADIO CHANNEL select switch: Switch positions 1-8 select (settings 9 & 0 are reserved for diagnostics and special functions).

5. ID DIP switch: This 2 position DIP switch works with the radio channel select switch to permit selection of any of the 32 available radio channels, as per the following chart:

Radio Channel Select Switch	ID DIP Switch	Radio Channels
1 - 8	OFF OFF	1 - 8
1 - 8	ON OFF	9 - 16
1 - 8	OFF ON	17 - 24
1 - 8	ON ON	25 - 32

Figure 23, Radio Selection Switch Chart

6. RESET switch: This switch is recessed to prevent un-intentional operation. Press with a pen or other similar device to reset the OEM Rx's internal processors.

7. DMX OUTPUT, 5P .100 Header: This is a standard DMX 512 output. Connect to Host equipment DMX input or 5P XLR Female for Standard DMX Output.

8. +5VDC power supply connection: connect to APS or user provided +5VDC Source.

In units modified by City Theatrical, there will be a mechanical indicator switch (“wink switch”) which changes the unit from ‘wired’ to ‘wireless’ DMX. By engaging this switch, the unit can be run with wired DMX, or with wireless DMX.

Standard Accessories

A wide range of accessories for implementing a WDS OEM Rx kit to your specific needs is available (see below). In addition, City Theatrical will be happy to develop and provide custom parts, interfaces, or accessories for any unique WDS requirement.

WDS OEM Rx Accessories	City Theatrical Part #
DC/DC APS Card	CTI # 5506
APS Card	CTI # 5507
OEM Rx Base Kit	CTI # 5508
Omni-Directional Antenna	CTI # 5530
Antenna Cable	CTI # 5531

Figure 24, Accessories Available for WDS OEM Rx Kit

Applications in City Theatrical's PDS Range

City Theatrical has incorporated its WDS technology into its PDS products enabling quick and convenient integration of WDS with Color Kinetics® ColorBlast®, ColorBurst®, and iColor® Cove intelligent solid-state lighting fixtures. Refer to "The OEM Receiver #5505" (pg. 21) for usage of WDS in these products. The PDS-375 TRw and PDS-750 TRw utilize a mechanical indicator switch to change the operation of unit between 'wired' and 'wireless.'

PDS Products Equipped with WDS	City Theatrical Part #
PDS-50	CTI # 6255
PDS-375 TRB	CTI # 6265
PDS-375 TRw	CTI # 6251
PDS-750 TRB	CTI # 6260
PDS-750 TRw	CTI # 6261
Wireless Chromasic PDS	CTI # 6290

Figure 25, WDS Equipped PDS Products

The WDS and PDS products can be used in a variety of ways. Below is a simple riser diagram relating one way City Theatrical's WDS system can be incorporated to power a number of Color Kinetic fixtures.

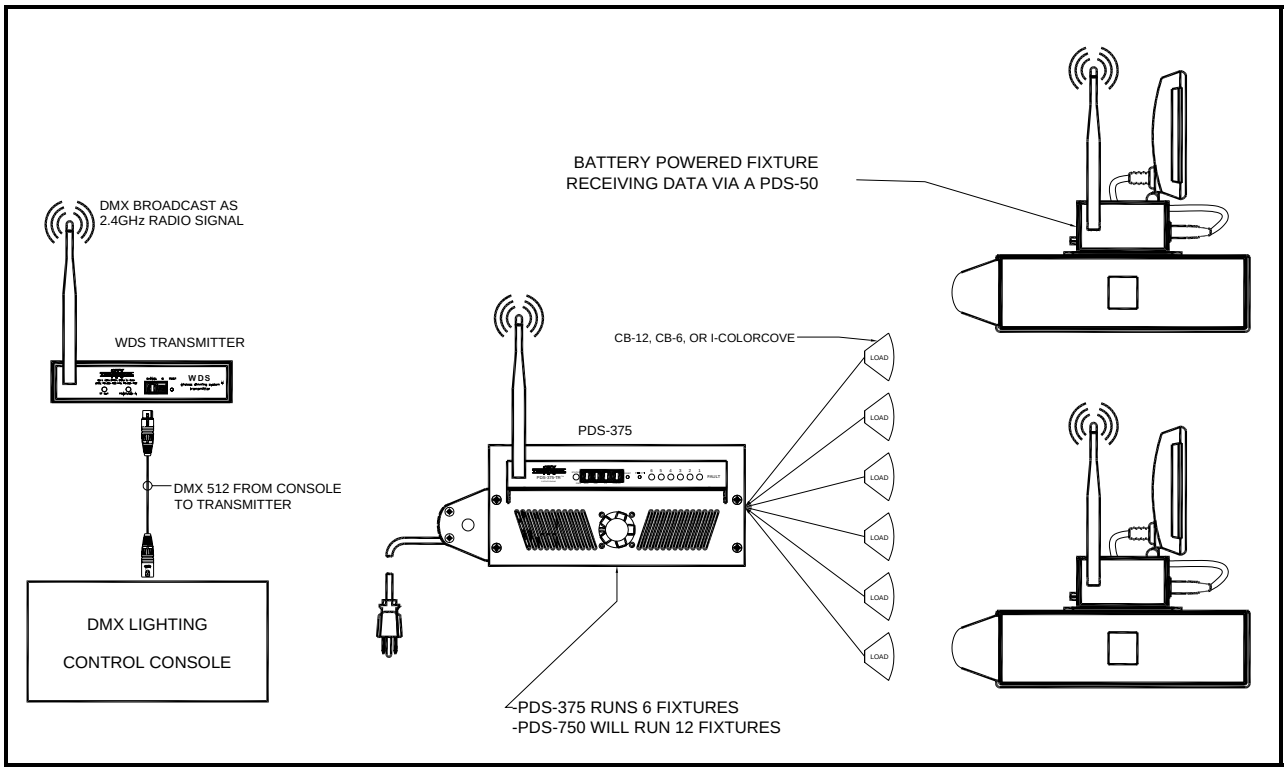

Figure 26, WDS/PDS Riser Example

The Four Port Opto-Receiver #5514

A new addition to City Theatrical's WDS line is the CE certified, RoHS compliant, Four Port Opto-Receiver which combines our 2.4GHz Receiver with an optically isolated four port repeater. The unit is housed in a rugged aluminum box complete with 1/2" mounting holes for use with C-clamps, and #10 countersunk screw holes for mounting to scenery. Power is supplied to the unit by means of a 12VDC battery or (included) CTI # 5525 100-240VAC 50/60Hz in 12VDC CL 2 power supply.

Figure 27, WDS Four Port Opto-Reciever

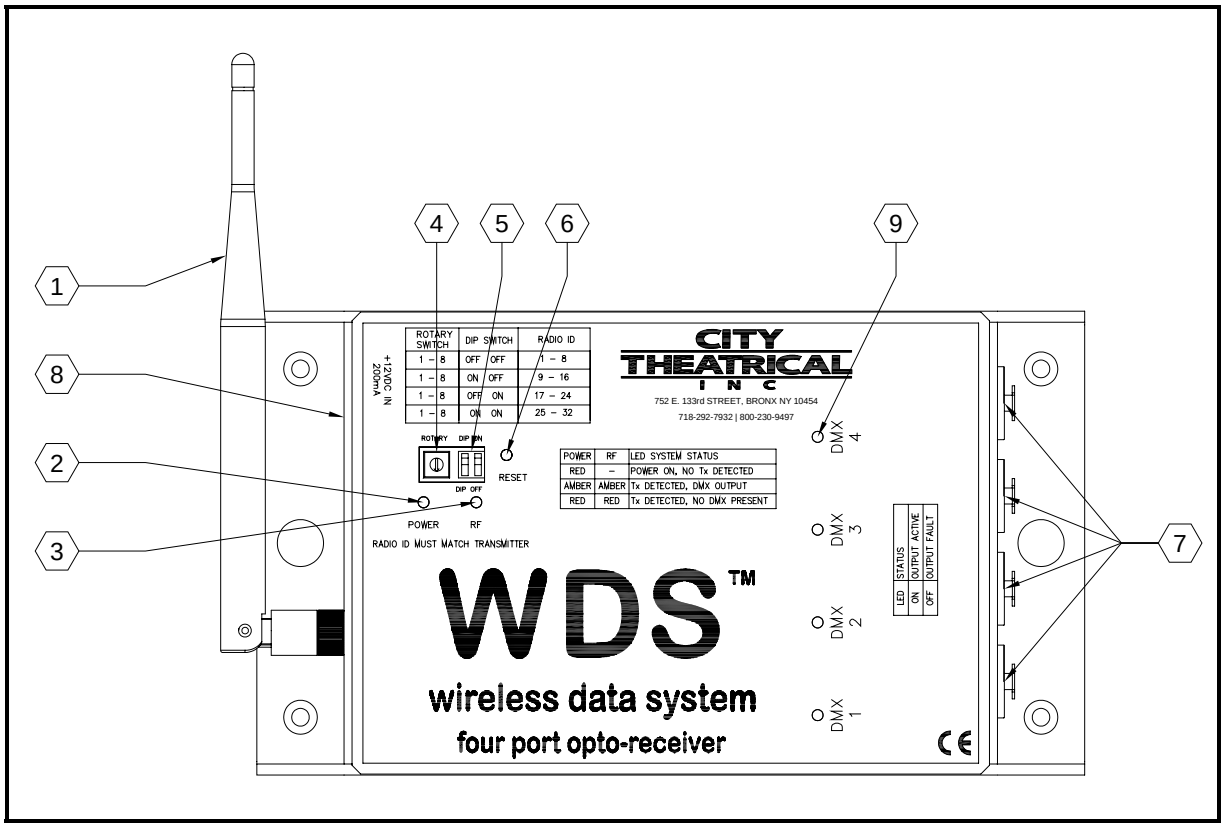

Figure 28, Four Port Opto-Receiver, Top Panel

The WDS Four Port Opto-Receiver receives DMX data as a radio signal, and outputs that data as standard DMX 512 via its four DMX OUTPUT connectors. The Four Port is equipped with the following features (see Figure 28).

1. Antenna: The antenna is multi-positional and may easily be removed for shipping or storage; unscrew to remove. Be sure not to over-tighten when attaching the antenna as the internal cabling may break

2. POWER/IN RANGE LED (item 2): This LED indicates the unit has power and is in range of a Transmitter. This LED will light green to indicate power is connected, and change to amber whenever a correctly configured Transmitter is detected.

3. RF IN/DMX OUT LED (item 3): This LED lights green when the unit is receiving RF DMX data and red when outputting standard DMX. Since the unit begins outputting DMX as soon as it receives RF, this LED normally appears amber when receiving/outputting.

LED Indicator	Color/Status	Indication
POWER/IN RANGE (2)	Green	Power Connected
	Amber	Transmitter Detected
RF IN/DMX OUT (3)	Green	Receiving RF DMX
	Amber	Outputting DMX

Figure 29, Four Port Opto-Receiver LED Key

4. RADIO CHANNEL select switch: Switch positions 1-8 select (settings 9 & 0 are reserved for diagnostics and special functions).

5. ID DIP switch: This 2 position DIP switch works with the Radio Channel select switch to permit selection of any of the 32 available radio channels, as per the following chart:

Radio Channel Select Switch	ID DIP Switch	Radio Channels
1 - 8	OFF OFF	1 - 8
1 - 8	ON OFF	9 - 16
1 - 8	OFF ON	17 - 24
1 - 8	ON ON	25 - 32

Figure 30, Four Port Opto-Receiver Rotary and DIP Switch Key

6. RESET switch: This switch is recessed to prevent unintentional operation. Press with a pen or other similar device to reset the Receiver's internal processors.

7. DMX OUTPUTS, 5P XLR Female: These are (4) standard DMX 512 outputs, optically isolated from one another. Connect to WDS Dimmers or other DMX devices.

8. +12V power supply connection: connect the mains power/+12V adapter or +12V battery here to power the unit.
9. OUTPUT LED: Conveys status of DMX output, ON = ACTIVE, OFF = FAULT.

The WDS Candle Adapter #5580

The 5580 WDS Candle Adapter enables wireless operation and battery dimming of City Theatrical Candle Lite Unlimited™ Flicker Candles (or other brand flicker candles) using either the 5520 WDS 15A Dimmer or the 5515 WDS Personal Dimmer. Candles operated in this manner require the Candle Adapter to optimize the output of the dimmer. Otherwise, they will not flicker properly or dim reliably.

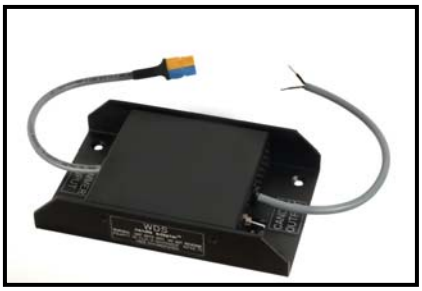

Figure 31, WDS Candle Adapter

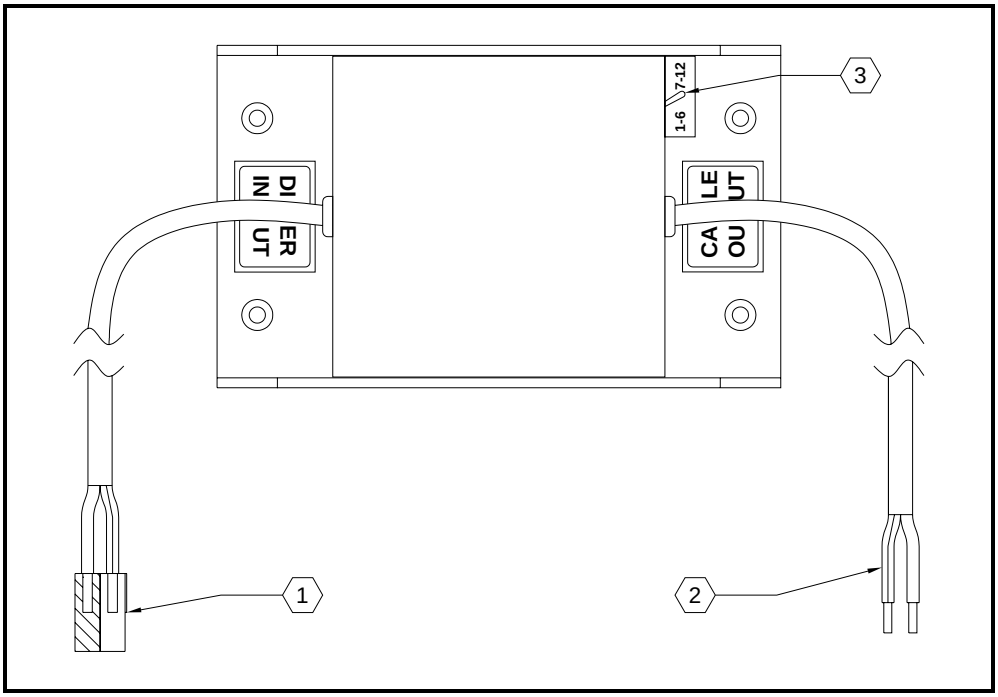

Figure 32, 5580 Candle Adapter, Physical Layout

The Candle Adapter has these key features:

1. POWER IN Anderson Power Pole Connector Set: Connect to 15A Dimmer Out. Yellow = + VDC (0-Full), Blue = DC Common.
2. CANDLE OUTPUT LEADS: bare, tinned leads for connecting to candles. Clear (#1) lead is + VDC, Black (#2) lead is DC Common.
3. CANDLE LOAD SWITCH: set switch to range of candles being used to achieve desired dimming curve.

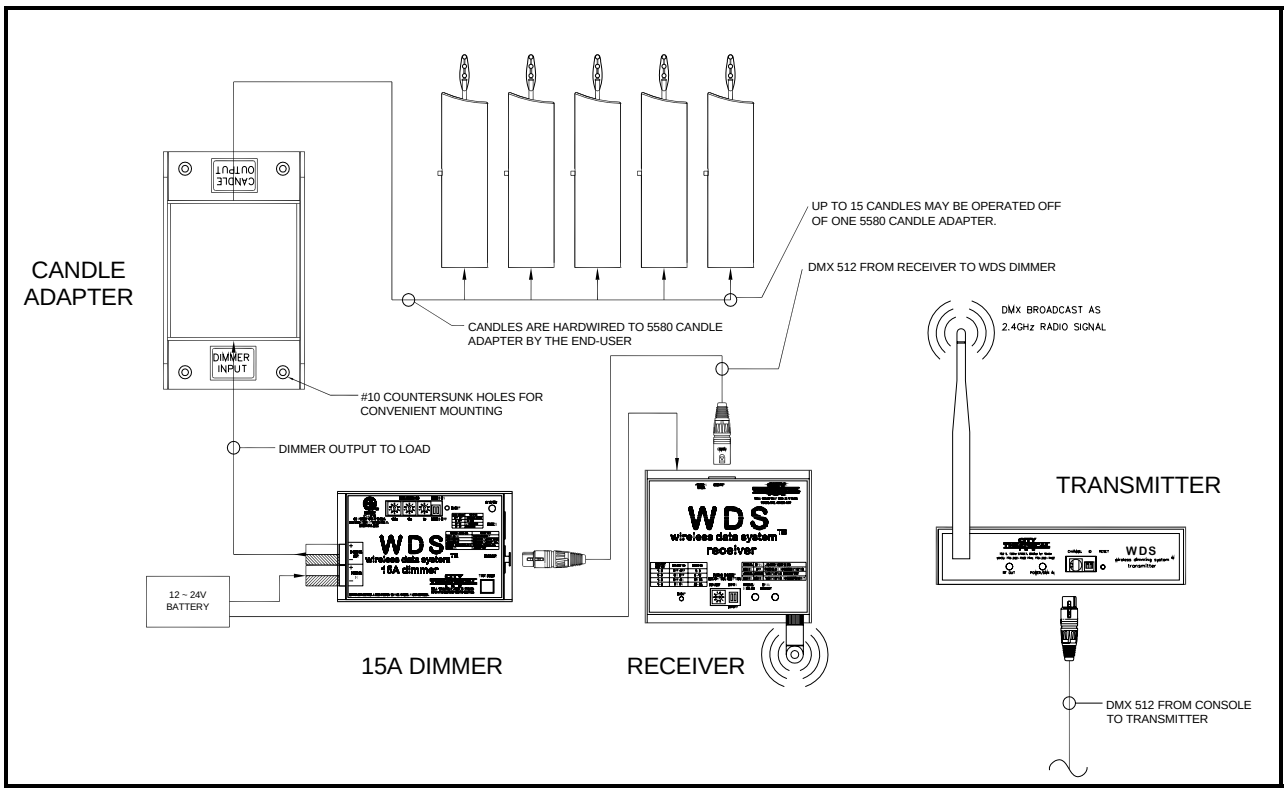

Figure 33, CANDLE ADAPTER TYPICAL RISER

User Application Notes:

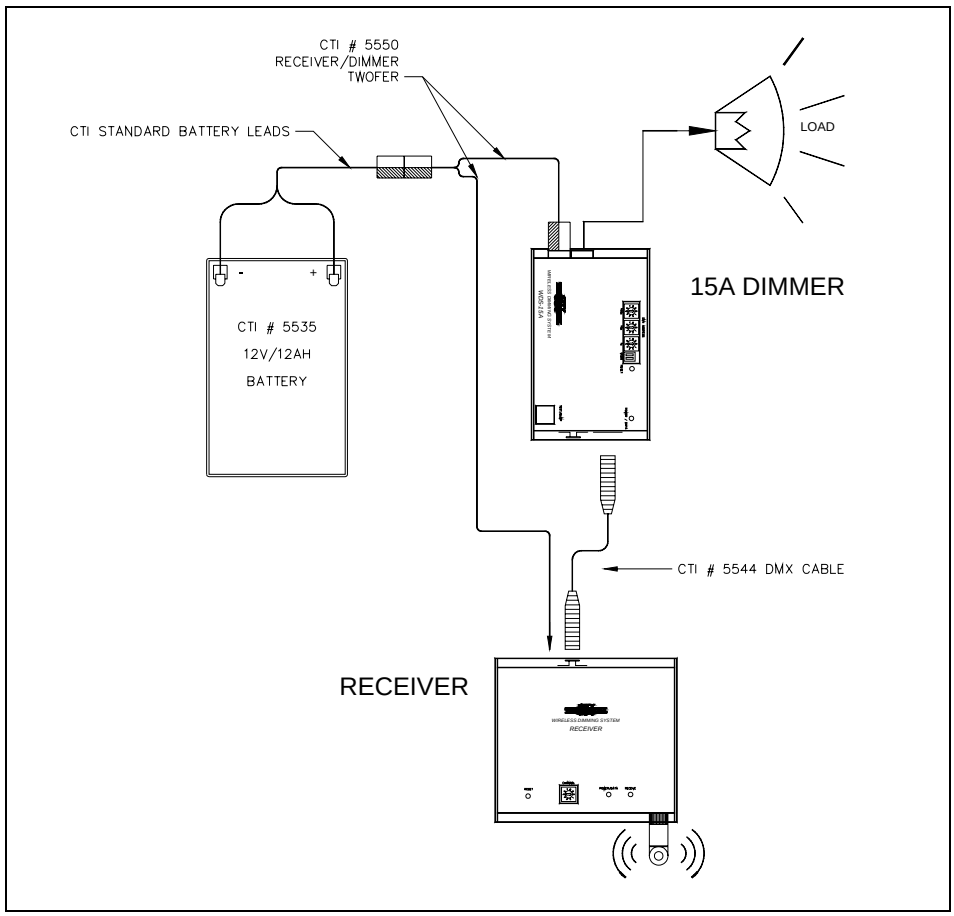

Figure 34, Typical Single 12V Battery System

Batteries and Power Considerations

Rechargeable 12V batteries used with this system may not charge readily with modern chargers if they are allowed to discharge past ~ 8.5VDC. When allowed to discharge more, the battery may load the charger too much, causing the charger to shut down[2] to prevent serious damage. Furthermore, with some loads the current draw will tend to rise as the available voltage drops. If the battery is allowed to discharge too far under these conditions, the current may exceed the limits of the system and cause overheating and/or blow the fuse.

For all these reasons, the WDS Dimmer is designed with a low power sensing system that shuts down the dimmer if the battery gets below a safe voltage limit (the standard factory setting is ~9VDC; custom units may be configured with a different limit voltage if needed, consult CTI for details).

The WDS 15A Dimmer will control a load of up to 15 amps at *any* voltage within its rated operating range of 12-24VDC. At 24V the maximum load is 360 watts, while at 12V the maximum load is 180 watts. Typical, continuous use battery life for the standard 12 Amp/Hour CTI 12V rechargeable battery (CTI # 5535) is shown on the next table.

[2] If this should happen, the charger may be jump-started by connecting the too-low battery in parallel with a charged battery, starting the charger, and then removing the full battery once the charging has reached a stable point.

Number of Batteries	Load Voltage	Battery Wiring	Total watts Load	Typical Battery Life per charge	Example of typical load types
1	12	n/a	150	20~25 minutes	2 x 75W MR 16 lamps
2	24	Series	300	20~25 minutes	24V Lamps
2	12	Parallel	150	40~50 minutes	2 x 75 W MR 16 lamps

Figure 35, Typical Continuous Battery Life for 12AH Battery

For extended 12V operation, 2 (or more) batteries may be connected together in parallel as suggested in the table above (see Figure 36). For 24V operation, 2 batteries may be connected in series so that the battery voltages add together (see Figure 37).

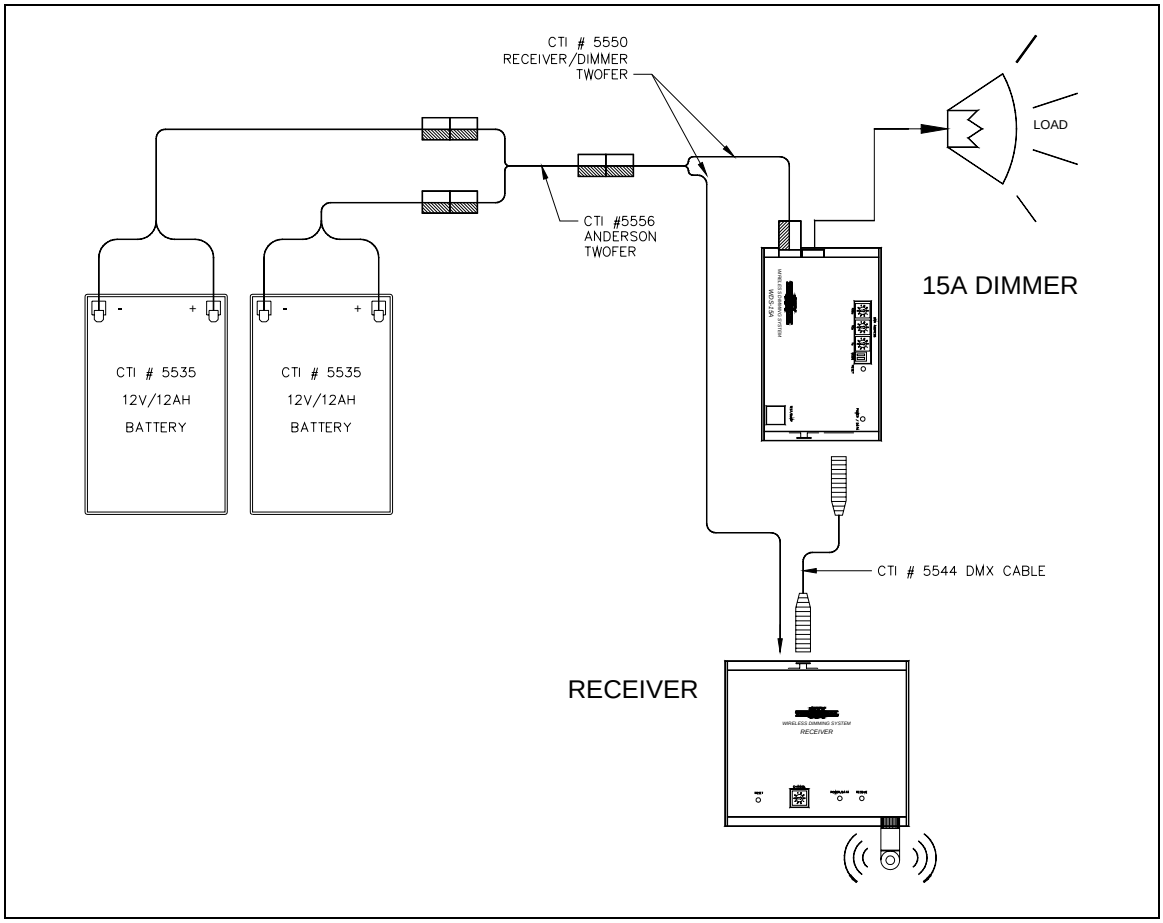

Figure 36, Two Battery 12V (parallel) System

For 24V Dimmer operation, it is recommended that the associated WDS Receiver be powered with 12V from only one of the batteries in the series array (see Figure 37).

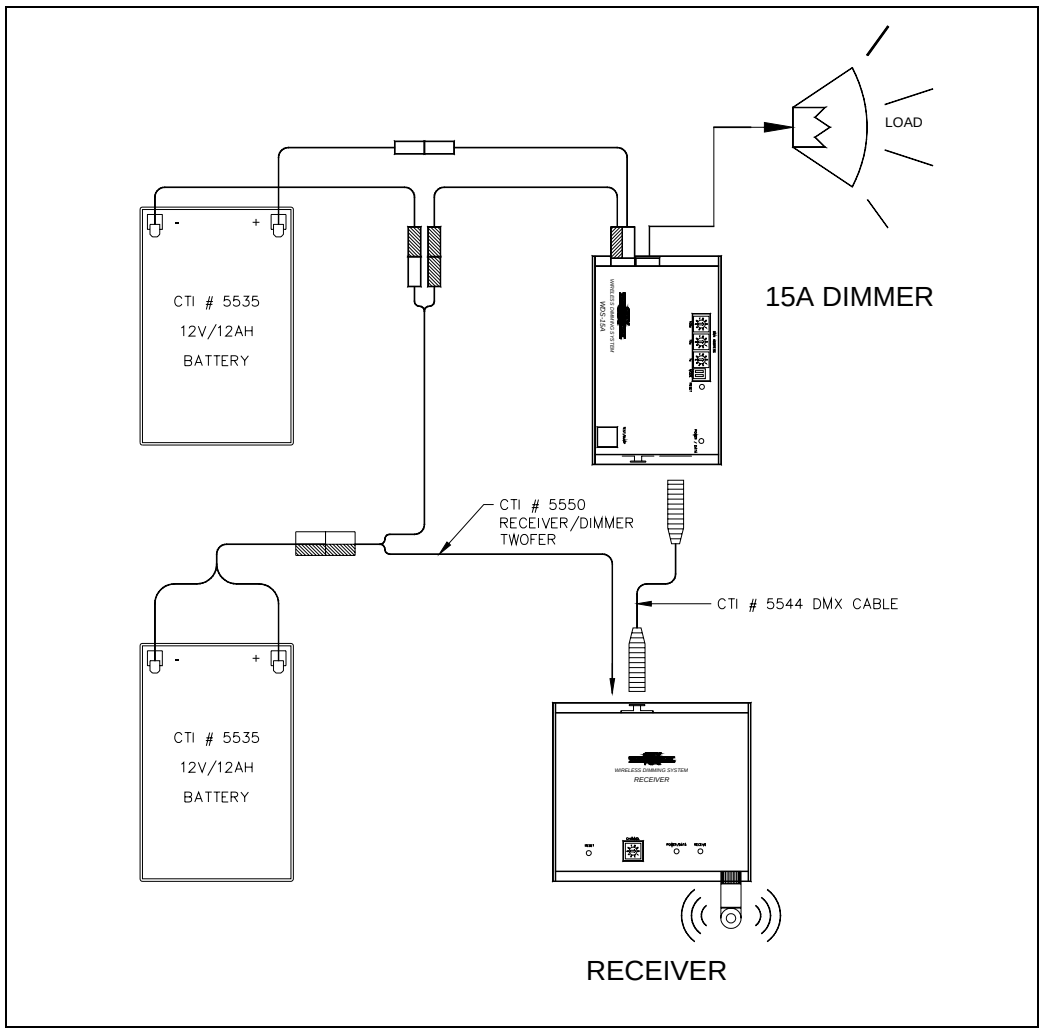

Figure 37, Two Battery 24V (series) System

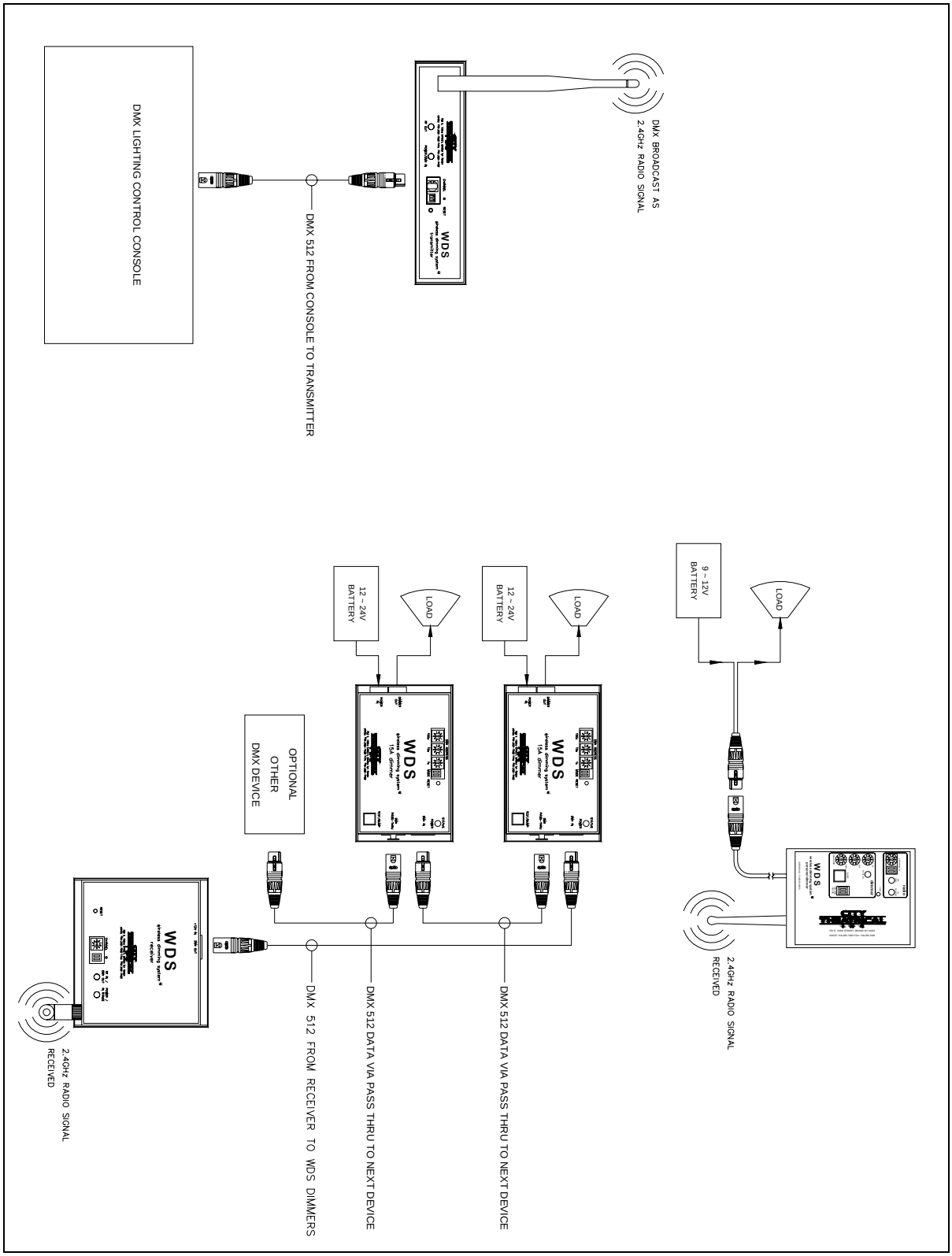

Figure 38, Typical WDS System with Personal Dimmer

Working in the Wireless World

Range

The theoretical maximum range for the 200mW system, indoor line-of-sight, is ~ 400-600 feet. In practice, range can vary depending on many environmental features, including structural metal in the area, ambient electrical activity, etc. For best results, it is recommended that the system be tested at the installation site to confirm usable range for that site, prior to final location of the equipment. The Transmitter and Receiver(s) should be positioned with a clear line-of-site between the units, and may need to be re-positioned for best results, particularly in electrically noisy or otherwise harsh environments.

Interference

The WDS system works in the 2.4GHz Broadcast frequency band, which is designated for license-free operation (within regulatory agency limits). This band is used by other equipment, notably 802.11B wireless Ethernet systems. Care should be taken not to place *either* system's transmitter in the line-of –sight between the other system's equipment.

Accessories

A full range of accessories is available for the WDS Dimming system (see below). Many different complete system configurations can be assembled entirely from the City Theatrical catalog. In addition, City Theatrical will be happy to develop and provide custom parts, interfaces, or accessories for any unique WDS requirement.

WDS System Accessory	City Theatrical Part #
Universal Input (90-240VAC, 50-60Hz) +12VDC CL 2 Power Supply for Transmitter and Receiver	CTI # 5525
7" Antenna	CTI # 5530
12V 12AH Rechargeable Battery with Standard Anderson Power Pole Connector Tails	CTI #5535
12V 5 A Auto-charger with Standard Anderson Power Pole Connector Tails	CTI # 5540
DMX Cable, 18"	CTI #5545
Power Twofer, Battery to Receiver and Dimmer	CTI # 5550
10' 2/12awg Jumper w/ color coded Anderson Power Pole Connectors	CTI # 5552
25' 2/12awg Jumper w/ color coded Anderson Power Pole Connectors	CTI # 5554
18" 2/14awg Twofer w/ color coded Anderson Power Pole Connectors	CTI # 5556
Anderson 30A Power Pole Connector, Red, w/ crimp terminal	CTI # 5560
Anderson 30A Power Pole Connector, Black, w/ crimp terminal	CTI # 5561
WDS Transmitter 1U Rackmount Bracket (for 1 or 2 Transmitters)	CTI # 5565
WDS Transmitter Pipe Mount Bracket	CTI # 5570
WDS Receiver Pipe Mount Bracket	CTI # 5570
WDS Candle Adapter	CTI # 5580
Custom Mounting Hardware	CTI # 5599
Custom Antennas	CTI # 5599

Figure 39, WDS Accessory List

General Specifications

RF Broadcast Frequency: 2.402 – 2.478 GHz

Compliance:

- 200 mW Transceiver - US (FCC15.247), Canada (IC)
- 10 mW Transceiver - US (FCC15.247), Canada (IC), Europe (EN)**
  ** Does not Include France or Spain

System Features:

- Rugged and compact steel and aluminum cases
- Standard DMX 512 inputs and outputs via Neutrik XLR connectors
- Fully opto-isolated DMX input
- Fully isolated DMX pass-through outputs on the Transmitter and Dimmer
- Auto-terminated DMX
- 32 radio channels
- Internal diagnostics

Unit Specifications

Transmitter #5500 or #5501:

- Dimensions: 3.813” x 7.50” x 1.687”
- Power: 12V AC or DC, 200mA
- DMX 512 Input: Neutrik NC5MBH 5 pin XLR male connector
- DMX 512 Pass-Through: Neutrik NC5FBH 5 pin XLR female connector
- LED pilot light
- LED data present light
- LED data transmit light
- Internal diagnostics
- Transmission capability: 512 channels of DMX 512 data as channels 1– 512
- Radio channels: 32, selectable via rotary BCD switch and 2 pos. DIP switch
- Antenna: Removable for packing

Receiver # 5510:

- Dimensions: 4.50” x 5.00” x 1.687”
- Power: 12V AC or DC, 200mA
- DMX 512 Output: Neutrik NC5FBH 5 pin XLR female connector
- Output capability: 512 channels of DMX 512 data received from Transmitter
- Radio channels: 32, selectable via rotary BCD switch and 2 pos. DIP switch
- LED Pilot light
- LED Data Receive light
- LED Data Output Light
- Internal diagnostics
- Antenna: Removable for packing

Rx2 Receiver #5512:

- Dimensions: 4.” x 7.50” x 1.625” (without C-clamp)
- Power: 100~240VAC 50/60 Hz .250 A
- DMX 512 Output: Neutrik NC5FBH 5 pin XLR female connector

- Output capability: 512 channels of DMX 512 data received from Transmitter
- Radio channels: 32, selectable via rotary BCD switch and 2 pos. DIP switch
- LED Pilot light
- LED Data Receive light
- LED Data Output Light
- Internal diagnostics
- Antenna: Removable for packing

15A Dimmer #5520:

- Dimensions: 3.25” x 5.25” x 1.687”
- Power: 12-24V DC, 200mA, From Load Battery Power
- DMX 512 Input: Neutrik NC5MBH 5 pin XLR male connector
- DMX 512 Pass-Through: Neutrik NC5FBH 5 pin XLR female connector
- DMX Addressing: any DMX address 1 – 512, configured with (3) standard BCD switches
- Bump button for load test
- LED Pilot light
- LED Data Present indication
- LED Output indication
- LED Low Power indication
- Internal diagnostics
- Power and Load Connectors: Anderson Power 1327 series
- Max output: 24VDC 15A
- Output: PWM Dimming from 00 (Off) to FF (Full)
- Three user-selectable output modes: two dimmer curves (ISL and linear) and non-dim

Personal Dimmer #5515:

- Integral WDS Receiver and 5A 12V Dimmer
- Dimensions: 3.30” x 4.30 x .8125”
- Power: 9~24V DC, 100mA, From Load Battery Power
- Radio channels: 32, selectable via rotary BCD switch and 2 pos. DIP switch
- Internal diagnostics
- DMX Addressing: any DMX address 1 – 512, configured with (3) standard BCD switches
- Bump button for load test
- LED Pilot lights
- LED Data Receive light
- LED Data Output light
- LED Data Present indication
- LED Dimmer Output indication
- LED Low Power indication
- Power and Load Connector: 4 Pin XLR Cable mount Male
- Output: PWM Dimming from 00 (Off) to FF (Full)
- Max output: 12VDC 5A
- Three user-selectable output modes: two dimmer curves (ISL and linear) and non-dim

OEM Receiver #5505:

- LED Pilot light
- LED Data Receive light
- LED Data Output light
- Flexible mounting options
- Easily customized

Four Port Opto-Receiver #5514:

- Dimensions: 1.5”W x 5.75”H x 11.75”D
- Power: 12VDC, 200mA
- Integral WDS Receiver and Four Port Optical Repeater
- LED Pilot light
- LED Data Receive light
- LED Data Output light
- Mounting points for C-Clamps, safety cables, or other standard stage hardware
- Countersunk #10 holes for mounting to scenery
- Antenna removable for packing
- Runs on 12VDC battery power or (included) CTI # 5525 100-240VAC 50/60Hz - 12VDC CL 2 power supply
- Compliance:
  - CE Certified, RoHS Compliant
  - 10 mW Transceiver - US (FCC15.247), Canada (IC), Europe (EN, Does not Include France or Spain)

Candle Adapter #5580:

- Dimensions: 7”W x 4.25”H x 1.375”D
- Capacity: Up to 15 candles, can be customized specifically to the user’s needs
- Low profile design
- Easily mounts to set pieces with screws or bolts (not included)